Hearing on Ballast Water Invasive Species Management and Threats to Coral Reefs
Senate Committee on Commerce, Science, and Transportation
National Ocean Policy Study Hearing

Testimony of Maurya B Falkner
Marine Invasive Species Program Manager
California State Lands Commission

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INTRODUCTION

Good morning, my name is Maurya Falkner, and I am the Program Manager for the Marine Invasive Species Program at the California State Lands Commission. I have been asked to provide testimony today on state efforts to control the transfer of non-native species through ballast water management as well as on efforts to meet or exceed the standards and timetables agreed upon in the International Maritime Organization's recently adopted Convention on Ballast Water Management.

California State Lands Commission (CSLC) has significant experience working to prevent and control the establishment of nonindigenous species via ballast water discharges. The 1999 Ballast Water Management for Control of Non-indigenous Species Act (Assembly Bill 703) charged the CSLC with oversight of the state's first mandatory program to prevent non-indigenous species (NIS) introductions through the ballast water of commercial vessels. Upon the sunset of the Act, the Marine Invasive Species Act (AB 433) was passed in 2003, revising and widening the scope of the CSLC program to more effectively address the NIS threat. Under the new Act, the expanded Marine Invasive Species Program (MISP) continues to monitor compliance with the requirement to manage ballast water of foreign origin. In addition, the program has initiated administration of the following efforts:

- Adopt reporting and ballast water management requirements for all voyages in the Pacific Coast Region
- Develop a program that supports the development of ballast treatment and management technologies
- Initiate discussions and develop policy recommendations for ballast treatment system performance standards
- Evaluate the risk of commercial vessel fouling as a means of NIS introduction, and formulate recommendations to reduce this risk
- Coordinate and consult with sister agencies that administer other components of the Act (esp. Department of Fish and Game and Board of Equalization)

The stated purpose of the Marine Invasive Species Act is to move the state expeditiously toward elimination of the discharge of nonindigenous species into the waters of the state or into waters that may impact the waters of the state, based on the best available technology economically achievable.

OVERVIEW

Non-indigenous species (NIS) are organisms that have been transported through human activities into regions where they did not occur in historical time, and successfully reproduce in the wild at their new location (Carlton 2001). Once established, such species can create negative economic, ecological, and human health impacts in their new environs. For marine and estuarine environments, the ballast water of ships is considered one of the major pathways through which foreign species are transported and spread (Stemming the Tide, 1996).

In response to this threat, the California Legislature passed Assembly Bill (AB) 703, the Ballast Water Management for Control of Nonindigenous Species Act in 1999. The law required that vessels originating from outside the United States Exclusive Economic Zone (EEZ) carry out mid-ocean exchange or use an approved ballast water treatment method, before discharging in California state waters. The California State Lands Commission's (CSLC) Ballast Water Management Program was tasked with several specific responsibilities.

- Receive and process ballast management reports submitted by all vessels arriving to California State waters from outside the EEZ.
- Monitor ballast management and discharge activities of vessels through submitted reports
- Inspect and sample vessels for compliance with the law
- Assess vessel reporting rates and compliance with the law

In recognition of the uncertainties surrounding the development of an effective ballast water management program for the State, AB 703 specified a sunset date of January 1, 2004. During the 2003 Legislative session, the act was revised and recast as AB 433, the Marine Invasive Species Act (Act). Several recommendations identified during the administration of AB 703 and detailed in the program's first biennial report (Falkner 2003) were incorporated into the 2003 law. In accordance with the Act, the State program was renamed the Marine Invasive Species Program (MISP), and charged with several expanded responsibilities. Key among these were:

- Authorization to pursue criminal and/or civil penalties for violations to the law.
- Adopt ballast water management regulations for vessels originating from within the Pacific Coast Region.
- Adopt regulations for the evaluation and approval of experimental shipboard ballast treatment systems.
- Sponsor a pilot program that will evaluate the feasibility of ballast water treatment technologies.
- Recommend performance standards for ballast treatment systems, in consultation with an advisory panel.
- Evaluate the risk of non-ballast ship-based vectors for spreading NIS and recommend actions to prevent associated introductions, in consultation with a technical advisory group.

Shipping Vectors - Also know as "introduced", "invasive", "exotic", "alien", or "aquatic nuisance species", non-indigenous species (NIS) in marine, estuarine and freshwater environments may be transported to new regions through numerous human activities. Intentional and unintentional introductions of fish and shellfish, aquaculture, illegal releases from the aquarium and pet industries, floating marine debris, bait shipping, and accidental release through research institutions are some of the mechanisms, or "vectors", by which organisms are transferred (U.S. Commission on Ocean Policy 2004). In coastal environments, commercial shipping is the most important vector for invasion, in one study accounting for one half to three-quarters of introductions to North America (Fofonoff et al. 2003). Vessels transport organisms through two primary sub-mechanisms: ballast water and fouling.

Ballast water is necessary for many functions related to the trim, stability, maneuverability, and propulsion of large seagoing vessels (Stemming The Tide 1996). Vessels may take on, discharge, or redistribute water during cargo loading and unloading, as they encounter rough seas, or as they transit through shallow coastal waterways. As ballast is transferred from "source" to "destination" ports, so are the many organisms taken into its tanks along with the port water. In this fashion, it is estimated that some 7000 plus organisms are moved around the world on a daily basis (Carlton 1999).

Fouling organisms are associated with hard surfaces that are exposed to water. These include organisms that physically attach to vessel surfaces, such as barnacles, algae, and mussels, and also includes mobile organisms that associate with fouling communities, such as worms, juvenile crabs, and amphipods (small shrimp-like animals). Vessels that spend long periods in port or move at slow speeds, such as barges and floating dry docks, appear to accumulate more extensive and diverse fouling communities (Godwin et al. 2004, Minchin and Gollasch 2003, Godwin 2003). In some circumstances,

fouling organisms have been observed to be in spawning condition at arrival ports (Coutts et al. 2003, Apte et al. 2000).

NIS Impacts - The rate, and thus the risk, of invasion has increased significantly during recent decades. The rate of reported invasions in North America increased exponentially over the last 200 years (Ruiz et al. 2000a). In the San Francisco Bay Estuary alone, a new species is believed to become established every 14 weeks (Cohen and Carlton 1998). One of the primary factors contributing to this increase is the expansion of global trade, and the technologies, which enable commodities to be transported swiftly and efficiently throughout the world. Along with goods, organisms are moved over land, air, and sea in larger numbers to more widespread locations, and are better able to survive the shortening excursions (Ruiz and Carlton 2003).

Once established, NIS can have severe ecological, economic, and human health impacts to the receiving environment. The most infamous example is the zebra mussel (*Dreissena polymorpha*) introduced to the Great Lakes from the Black Sea. They attach to hard surfaces in dense populations that clog municipal water systems and electric generating plants, resulting in costs of approximately a billion dollars a year (Pimentel et al. 2004). The Asian clam (*Potamocorbula amurensis*) spread throughout the San Francisco Bay and its tributaries two years after its introduction, and accounts for up to 95% of living biomass in some shallow portions of the bay floor (Nichols et al., 1990). Like its Great Lakes counterpart, the Asian clam fouls power plant structures, costing approximately a billion dollars per year during the early 80's for control and losses (Lovell and Stone 2005). The Chinese mitten crab, *Eriocheir siensis*, was first sighted in the San Francisco Bay in 1992, and quickly spread through the system, clogging pumping stations and riddling levies with burrows (Rudnick et al. 2000). Costs for control and research were $1 million in 2000-2001 (Carlton 2001). The European green crab (*Carcinus maenas)*, thought to have caused the crash of the Maine softshell clam fishery, arrived in California during the mid-1990s (Grosholz and Ruiz 1995). There are fears that it will compete for food with the valuable Dungeness crab (*Cancer magister*) threatening the west coast fishery. The microorganisms that cause human Cholera (Ruiz et al. 2000b) and paralytic shellfish poisoning (Hallegraeff 1998) have also been found in the water and sediments in ballast tanks.

Prevention through Ballast Water Management - Attempts to eradicate NIS after they have become widely distributed are typically unsuccessful and costly (Carlton 2001). Control is likewise extremely expensive. For example, approximately $10 million is spent annually to control the sea lamprey (*Petromyzon marinus*) in the Great Lakes (Lovell and Stone 2005); $2.3 million was spent to control the Mediterranean green seaweed (*Caulerpa taxifolia)* in southern California during 2000-2001, and $2 million was spent in Washington to control Atlantic cordgrass (*Spartinia alterniflora*) between 1999-2001 (Carlton 2001). Prevention is therefore considered the most desirable way to address the issue.

For the vast majority of commercial vessels, open-ocean ballast exchange more than 200 nm offshore is the primary method of ballast water management. Currently, it is the best compromise of efficacy, environmental safety, and economic practicality. The vast majority of vessels are capable of conducting exchange, and the management practice does not require any special structural modification to most of the vessels in operation. Scientific research indicates that offshore ballast exchange typically eliminates 70% - 95% of the organisms originally taken into a tank while at or near port (Zhang and Dickman 1999, Parsons 1998, Cohen 1998). Ballast water exchange, however, is widely considered an interim ballast water management tool because of its variable efficiency, and due to several operational limitations. In the future, a vessel would ideally utilize alternative ship- based or shore based treatment systems that reduce organisms in ballast water as well as, or better than open-ocean exchange.

Rules Governing Ballast Water Management - The ballast water regulations and guidelines of the nations and U.S. states that regulate ballast water share several similar components. All allow ballast water exchange as an acceptable method of ballast water management, and provide some type of exemption should a vessel or its crew become endangered by the exchange process. All accept approved alternative ballast water treatments in anticipation that an effective technology is developed. All but the International Maritime Organization require the completion and submission of forms detailing ballast management and discharge practices.

International Regulations - The International Maritime Organization (IMO) adopted the International Convention for the Control and Management of Ships' Ballast Water and Sediments in February of 2004, which becomes effective one year after ratification by 30 countries representing 35% of the world shipping tonnage (International Maritime Organization). Vessels must conduct exchange at least 50 nm from shore in waters at least 200 meters deep, though it is preferred exchange be conducted 200 nm offshore. Vessels can forgo these exchange requirements if compliance would result in undue delay or deviation from the vessels' intended voyage. In anticipation of the improvement and installation of ballast water treatment systems, the Convention also calls for a gradual phase our of ballast water exchange. Depending on construction date and ballast water capacity, vessels will instead be expected to meet a ballast water discharge standard according to fixed dates. Finally, a significant provision of the Convention is the provision that recognizes the right of member states to take more stringent measures to prevent NIS introductions. As of spring 2005, the United States had not signed onto the convention.

Canada, Australia & New Zealand - Canada adopted voluntary guidelines in 2001, and vessels are requested to conduct exchange in waters 200 nm offshore and 2000 meters or deeper. The ports of Vancouver, Nanaimo, and Fraser River make these voluntary guidelines mandatory, though vessels arriving from Alaska and U.S. west coast ports north of Cape Mendocino are exempted (Transport Canada 2001). Australia requires ballast water exchange outside of the 12 nm Australian limit in waters greater than 200 m deep, and ballast water from "high risk" areas are prohibited (Australian Quarantine and Inspection Service). In New Zealand, vessels must conduct mid-ocean exchange in waters at least 200 nm offshore and must obtain permission before discharging, even if ballast water has been exchanged. Absolutely no discharge is allowed if vessels contain water from the "high risk" ports of Tazmania and Port Philip Bay, both in Australia (New Zealand Ministry of Fisheries).

Federal Regulations - In September of 2004, the United States Coast Guard adopted mandatory ballast water management regulations for vessels entering from outside the EEZ. Exchange is required to be conducted more than 200 nm offshore, however, vessels that experience undue delay are exempted. There is no management requirement for vessels traveling "coastally", or wholly within the 200 nm EEZ.

Several pieces of federal legislation that address NIS introductions are currently moving through Congress. One, S363, the "Ballast Water Management Act of 2005" addresses the National Invasive Species Act's ballast water management program (16 USC Section 4711), and would provide a national system for implementing ballast treatment control technologies over time.

Mainland U.S. Pacific Coast - With the exception of Alaska, all U.S mainland Pacific states have adopted ballast water management regulations that are more comprehensive than the federal requirements. Oregon began requiring ballast water management in 2002. Vessels of foreign origination are required to conduct exchange at least 200 nm offshore. However, for vessels traveling within 200 nm and entering Oregon from areas north of 50° N, or south of 40° S, a "coastal" exchange of unspecified distance offshore is required (Flynn and Sytsma 2004). Legislation requiring coastal exchange at 50 nm offshore was passed in the Oregon Legislature and goes into effect at the end of 2005. Washington's year 2000-exchange requirement for foreign vessels is identical to Oregon's. Coastally transiting vessels are generally required to conduct exchange at least 50 nm offshore, with the exception that exchange is not required if the water is common to the state and has not been mixed with waters outside of the Columbia River system (Washington Department of Fish and Wildlife 2003).

California - California's initial legislation, Assembly Bill 703 (AB 703), addressed the ballast water invasion threat at a time when national regulations were not mandatory. The Ballast Water Management for Control of Nonindigenous Species Act, passed in 1999, established a statewide multi-agency program to prevent and control NIS in state waters. In addition to the CSLC, the California Department of Fish and Game (CDFG), the State Water Resources Control Board (SWRCB) and the Board of Equalization (BOE) were charged to direct research, monitoring, policy development, and regulation, and to cooperatively consult with one another to address the problem (Falkner 2003). AB 703 required that vessels entering California from outside the EEZ manage ballast before discharging into state waters. Vessels were required to exchange ballast water 200 nm offshore or treat ballast water with an approved shipboard or

shore-based treatment system. There was, however, no management requirement for vessels transiting between ports wholly within the EEZ, despite evidence that "intra-coastal" transfer may facilitate the spread of NIS from a location where it is firmly established, San Francisco Bay for example, to an adjacent port where it is not (Lavoie et al. 1999, Cohen and Carlton 1995). The Legislature, sensitive to the uncertainties surrounding the development of an effective ballast water management program for the State, included a sunset date of January 1, 2004 in AB 703. In 2003 Assembly Bill 433 was passed, reauthorizing and enhancing the 1999 legislation to include many of the recommendations of the program's first biennial report (Falkner 2003).

CALIFORNIA'S MARINE INVASIVE SPECIES PROGRAM

The California Legislature passed Assembly Bill 433 during the 2003 regular session, and was signed by the Governor in October 2003. The bill reauthorized, enhanced, and renamed the State's ballast water management program, creating the Marine Invasive Species Act (Act). The Act applies to all U.S. and foreign vessels, over 300 gross registered tons that arrive at a California port or place after operating outside of California waters. All vessels arriving at a California port or place must have a ballast water management plan and ballast tank logbook specific to the vessel. Each vessel is required to pay a fee of $500 at its first port call in California. Additionally, each vessel is required to submit a ballast water reporting form upon departure from each port call in California waters detailing their ballast water management practices. However, only vessels arriving from outside the EEZ are required to manage their ballast water as prescribed in the Act. The Act does direct the CSLC to adopt regulations for vessels transiting within the Pacific Coast Region and the Rulemaking process currently underway will require coastal exchange at 50 nm offshore for such voyages. The effective date of the regulation is anticipated in late 2005.

In addition to regulatory directives, the Act included mandates to address gaps identified during the beginning years of the program that would improve the ability of the program to prevent NIS introductions. The Commission's Marine Invasive Species Program (MISP) has formed several Technical Advisory Groups (TAG) that discuss policy and regulatory matters related to general NIS management and the implementation of legislative mandates. In January 2000, a general TAG was convened to discuss regulatory matters and continues to meet periodically. In 2005, two specialized advisory group were assembled to formulate recommendations for ballast treatment performance standards and vessel hull fouling. TAGs include representatives from the maritime industry, ports, state agencies, environmental organizations, and research institutions, and serve several critical outreach functions. They serve as a forum through which information and ideas can be exchanged, and ensure that rulemaking decisions consider the best available science as well as the concerns of affected stakeholders. TAG members also relay information to their respective constituencies, keeping them abreast of CSLC actions and activities.

The Marine Facilities Division of the CSLC administers the State's Marine Invasive Species Program (MISP). The MISP staff are active members in several ballast water related groups including: the Ballast Outreach Advisory Team, Sea Grant Extension; Oregon's Ballast Water Management Task Force; Aquatic Nuisance Species Task Force; and the Pacific Ballast Water Working Group. Wherever possible, staff works with the scientific community, other West Coast state representatives, Federal agencies, and the international maritime community to standardize ballast water management programs. This coordination has improved support and compliance by the maritime industry, and has enhanced understanding and the development of solutions to NIS introductions.

The CSLC MISP Inspection Program consists of an extensive monitoring program to ensure compliance and facilitate communication, and is implemented by field offices located in Northern and Southern California. All vessels are required to submit to compliance inspections, which include sample collection of ballast water and sediments, examination of documents, and any additional appropriate inquiries. The Act specifies that inspections be conducted on at least 25 % of the arriving vessels, with enforcement administered through the imposition of administrative civil and criminal penalties. In addition to verifying compliance with the management requirements of the Act, the Inspection Program plays a key role in outreach and education for the maritime industry.

Assembly Bill 703 created the Exotic Species Control Fund (the Fund) to support each agency's program (Section 71215). All vessels subject to the law are required to submit a fee at its first port call in California. The State's fee-based program has been cited as an important reason for the program's success (Vinograd & Sytsma 2002). Reauthorization of the State's Program under AB 433 included the reauthorization and renaming of the Fund to the Marine Invasive Species Control Fund. The amount of the Fee is based on agency budgets approved by the State's Legislature and totals $16.1 million over 6 years. Budgets cover the CSLC's ballast water inspection and monitoring program, the development and implementation of regulatory packages, research on alternative treatment technologies, hull fouling vectors, and performance standards. The budget also covers the biological surveys conducted by the CDFG to track the extent of NIS introductions in State waters, costs for Fee assessment by the BOE, and consultation by SWRCB. CSLC was given the authority to establish the Fee amount, up to the maximum of $1000 per voyage. In January 2000, a TAG was formed, made up of members of the maritime industry and state agencies. The TAG has proved beneficial for determining the appropriate Fee amount and for addressing issues related specifically to the implementation of the California Act. The TAG meets regularly to assess the effectiveness of the Program and the status of the Fund. Currently the Fee is $500/voyage, but will be decreased to $400/voyage in mid-2005.

Outreach and Education - *Coastal Exchange Stakeholder Workshops* - Two stakeholder workshops were held in 2002 and 2003 to address and inform coastal ballast water management in the Western Pacific Coast Region. As a result of these meetings and a subsequent stakeholder meeting in July 2004, CSLC submitted a Rulemaking package in April 2005 to the State's Office of Administrative Law, proposing to govern the ballast water management of vessels operating within the Pacific Coast Region.

Outreach to Maritime Industry **-** One of the key components for the success of the program continues to be the close communication, coordination, and outreach that occurs between the CSLC, the maritime industry, and other state agencies. The CSLC facilitates this communication through several specific avenues including monthly late form notifications, vessel inspections, advisory groups, a web site, and through participation in pubic and scientific workshops, and public speaking engagements.

During the first year of the program, a dramatic increase in reporting compliance (submission of ballast water reporting forms) was observed following the initiation of a monthly notification system and issuance of warning letters (Falkner 2003). These activities have subsequently become an integral part of the program. Each month a list of ballast water reporting forms received by the CSLC is reconciled with a list of vessel arrivals reported by the Maritime Exchanges. Qualifying voyages that appear on the Marine Exchanges report but have not submitted reporting forms to the CSLC are flagged. On or about the fifth of every month, individual agents are then sent a master list of vessels under their purview, indicating which have punctually sent forms and which have not. If a delinquent form is not received within 60 days, a warning letter is sent to the agent. Subsequent enforcement action is taken as necessary.

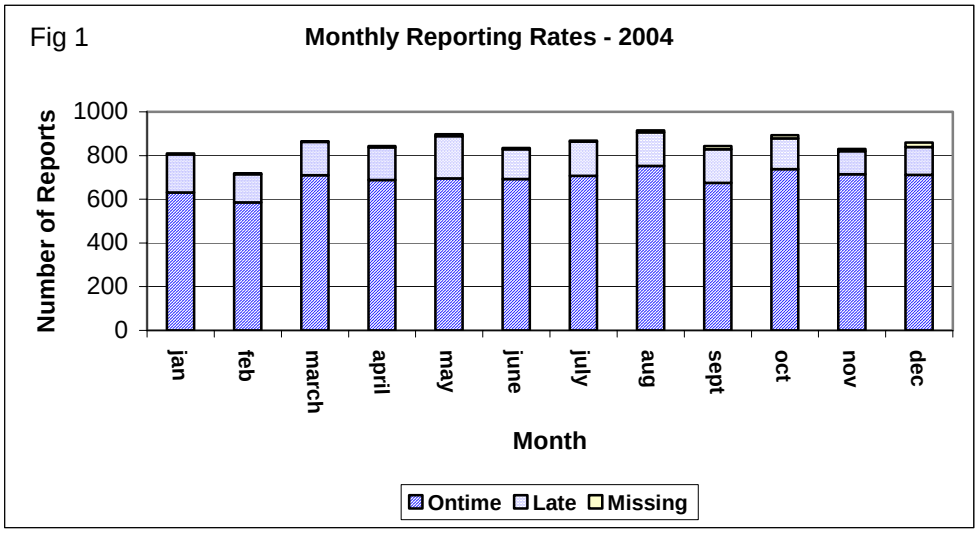
Though this notification process is time intensive, it assures direct, periodic communication with more than 60 shipping agents and has been well received by the maritime industry. Ship owners and agents also contact CSLC personnel directly with questions or concerns. Monthlies and warning notifications have resulted in reporting compliance rates that have increased from ~60% in early 2000, to 93% by June 2002, to over 98% 2004.

CSLC inspectors serve as an important direct conduit of information to vessel crews, particularly in an industry where vessels often change ownership, routes, and crew composition. During vessel visits, inspectors verbally explain paperwork, reporting, ballast management obligations, and point out where a vessel may be falling short of compliance. For vessels that call at a California port for the first time, inspectors distribute informational packets that include a summary of the California law, instructions on completing the ballast water form, and contacts for more information on west coast ballast regulations.

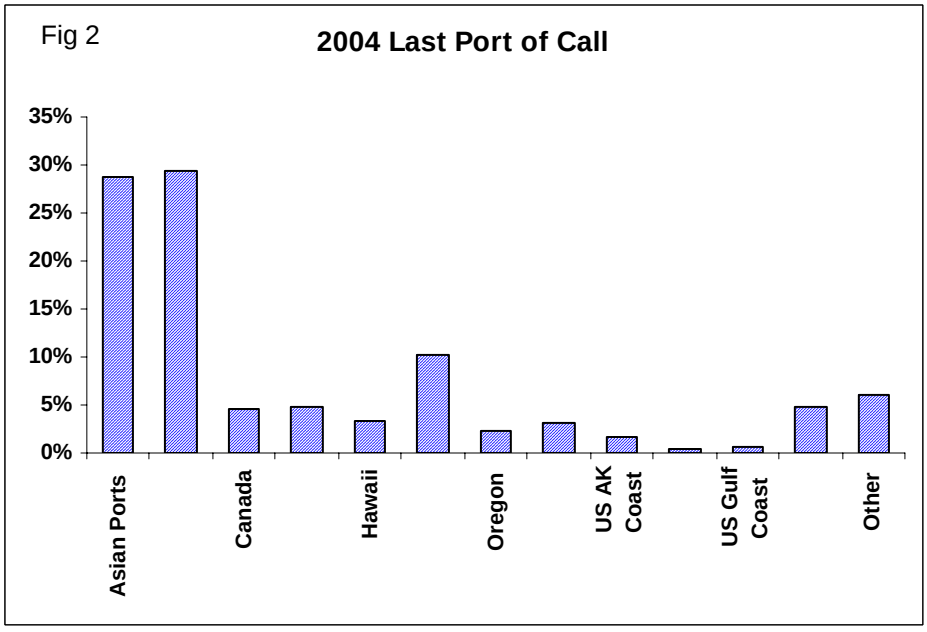
CSLC staff actively continues to facilitate communication among stakeholder groups through several additional vehicles. A website contains programmatic background information, downloadable forms and reports, and rulemaking and public hearing announcements. Attended events have ranged from those

sponsored by industry, and by federal and state organizations. CSLC has also initiated or collaborated on numerous workshops, conferences, and speaking engagements to further enhance outreach efforts.

Compliance - Vessel compliance with the requirement to report ballast management and discharge practices is very high, and has risen dramatically since the inception of the program. In 2003 97% of vessels submitted reports, up from approximately 60% observed during the first six months of the program in 2000. In 2004, even with the new requirement that voyages between Pacific Coast ports or places were required to submit reports, compliance exceeded 98%, with 82% submitting reporting forms on time (Figure 1).

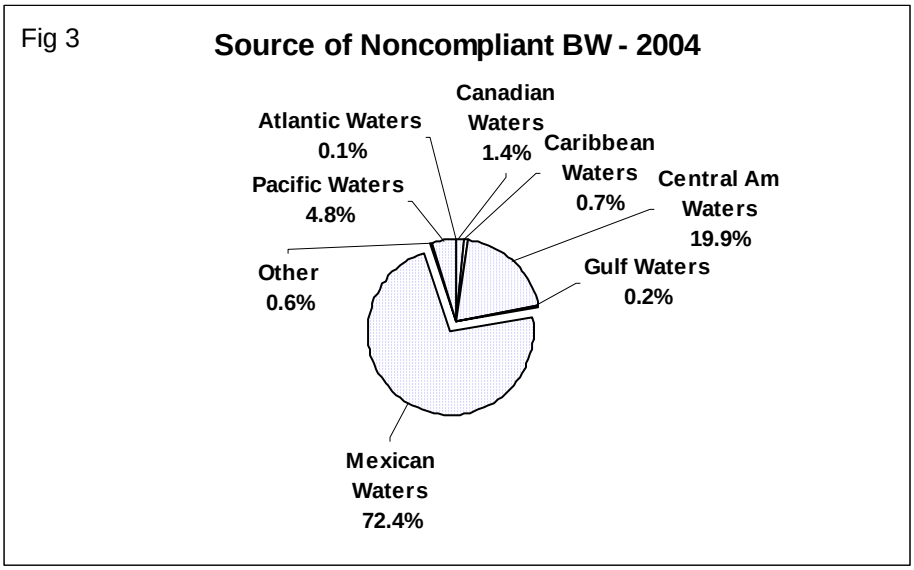


During 2004, all vessels were required to submit a reporting form for each port call in California. The change in QV to include domestic voyages is readily observed in the data. The percentage of arrivals originating from Asian ports dropped from over 50% in 2003 to less than 30% in 2004 (Figure 2). It also becomes apparent that a large proportion of vessels arrive to California ports from other California ports.



Of the 10074 reporting forms received for Year 2004, 83% retained all ballast water on board, while 17% reported discharges in State waters. Over 95% of all ballast water discharged in State waters complied with the law. Of the unexchanged ballast water that was discharged during 2004, the majority originated from coastal Mexican waters (Figure 3). This pattern highlights the need for intense targeted compliance monitoring and enforcement action as necessary by CSLC. Additionally, it reinforces the need for the development of environmentally safe shipboard treatment systems, as well as the identification of alternative exchange zones within coastal waters.

Fig 3



Likewise, vessel-reported compliance with the requirement to manage ballast originating from waters outside the US EEZ continues to exceed 90%. In 2004, 7.8 million metric tons of ballast water was reported to have been discharged in state waters, only 4% did not complied with the mid-ocean exchange requirements (Table1).

Table 1 Year 2004 Volume (MT) of ballast water discharged by Port.

Port	Compliant (MT)	Not Compliant (MT)	Total Discharged	% Compliance	% Non-Compliance
Avalon	24123	0	24123	100%	0%
Carquinez	469037	20893	489930	96%	4%
El Segundo	66212	0	66212	100%	0%
Hueneme	7045	2587	9632	73%	27%
Humboldt	48699	1484	50183	97%	3%
LA-LB	3643580	215129	3858709	94%	6%
Monterey	6	0	6	100%	0%
Oakland	424965	3518	428483	99%	1%
Redwood	59998	20702	80700	74%	26%
Richmond	1129114	12222	1141336	99%	1%
Sacramento	1028443	15804	1044247	98%	2%
San Diego	38982	3015	41997	93%	7%
San Francisco	317584	30489	348073	91%	9%
Santa Barbara	23219	0	23219	100%	0%
Stockton	149398	23763	173161	86%	14%
Statewide Totals	**7430405**	**349606**	**7780011**	**96%**	**4%**

Vessel inspections conducted by CSLC staff revealed similarly high compliance rates. During the 2003-2004 period, 2318 inspections were completed. Less than 5% of the noted violations were associated with operational aspects of the law, which includes improper ballast water management (Table 2). In late-2003, CSLC initiated a procedure to ensure that any violations identified during inspections were corrected in advance of the vessel's next visit to California waters. A letter detailing any violations noted during inspections and appropriate corrective action is sent to the registered ship owner. The response from vessel owners has been overwhelmingly positive.

Table 2 Ballast Water Inspections by Port

Port	Year 2003				Year 2004			
	# Inspections	# Violations	# Admin	# Operational	# Inspections	# Violations	# Admin	# Operational
Carquinez	86	6	5	-	134	11	9	2
El Segundo	8	-	-	-	5	-	-	-
Hueneme	28	6	6	-	15	9	9	-
Humboldt	3	-	-	-	4	-	-	-
LA-LB	558	141	135	6	682	219	207	12
Oakland	137	3	3	-	265	32	32	-
Redwood	13	1	1	-	17	2	1	1
Richmond	41	2	1	1	127	9	7	2
Sacramento	10	-	-	-	12	3	3	-
San Diego	42	-	-	-	33	-	-	-
San Francisco	20	-	-	-	20	7	7	-
Stockton	16	-	-	-	42	10	9	1
Total	**962**	**159**	**151**	**7**	**1356**	**302**	**284**	**18**

The high compliance rates observed in the California Program are attributable to the multipronged outreach and communication activities undertaken by the CSLC. Inspectors distribute information verbally and in print to crews on regulations. Agents are notified monthly of their vessels' reporting compliance or non-compliance. Multi-agency, multi-interest advisory groups are continually convened and consulted regarding evolving policy considerations. These efforts serve to maintain well-informed stakeholders, build working relationships with affected parties, and ensure that regulations are wisely developed.

Fee Submission - While the CSLC has authority to establish the Fee amount; assessment of the Fee is the responsibility of BOE. The BOE receives daily reports from the Los Angeles/Long Beach Marine Exchange listing actual arrivals from the following ports: Los Angeles/Long Beach, Port Hueneme, San Diego, and El Segundo. In addition, the Board receives two daily reports from the San Francisco Marine Exchange. An electronic and paper record of this information is maintained for reference and use by the BOE staff. The reports are reviewed to determine which arrivals are Qualifying Voyages and thus subject to the Fee. In 2001, a return (self-reporting) process was initiated by BOE to reduce the overall number of billings, though not the amount of revenue collected. With the assistance of industry representatives, a return form was developed allowing the larger owner/operator/agents to self-report their vessel voyages.

There are currently 2,508 ballast accounts representing 6,449 vessels registered with the BOE. On average, 120 new Ballast Registrations are added per month. In addition, an average of 115 account maintenance items (address changes, adding vessels to existing accounts, etc.) are processed per month. An average of 25 Ballast Accounts are closed out each month, and an average of 470 Ballast Water billings are mailed per month. Compliance rate for fee submission exceeds 98%.

COLLABORATIVE PROJECTS/RESEARCH/TECHNOLOGY DEVELOPMENT

Treatment Technologies - Though ballast water exchange is by far the most widely used ballast water management tool, the eventual goal is to manage ballast water through ship-based or shore-based

treatment systems. Ballast exchange can expose vessels to some risk and may delay voyages. As described above, exchange can expose vessels to some risk and may delay voyages. The efficiency of exchange is also quite variable, and can depend on a vessel's configuration or age. Though no alternative treatment technologies are available for widespread installation, several promising enterprises are under development.

The Ballast Water Management Act of 1999 directed CSLC to evaluate and approve alternative treatment technologies designed to remove and or inactivate organisms in ballast water. The Marine Invasive Species Act of 2003 authorized the CSLC to sponsor a pilot program for the purpose of evaluating alternatives for treating and otherwise managing ballast water, and also authorizes the CSLC to sponsor other research related to the transport and release of non-indigenous species into California waters.

CSLC staff collaborates with other agencies and organizations to identify alternative methods for ballast water management. In the past 18 months, the CSLC has reviewed and considered for funding two alternative treatment technologies. The Venturi Oxygen Stripping System and the Ecochlor Ballast Water Treatment System have each shown, through initial studies that shipboard applications may be effective. Further research is needed, and CSLC will be funding at least one, possibly both of these proposed projects.

West Coast Ballast Water Demonstration Project - In August 2000, the California State Lands Commission was awarded a $150,000 grant from the U. S. Fish and Wildlife Service (USFWS) to implement the West Coast Regional Applied Ballast Management Research and Demonstration Project (West Coast Demonstration Project). The West Coast Demonstration Project was an inter-agency pilot project to acquire and distribute information regarding applied alternatives for ballast water management. In December 2000, the Port of Oakland agreed to match the USFWS funds, doubling the funds available for this project, making it possible to evaluate the efficacy of treatment systems onboard at least two vessels. The SWRCB received $150,000 from the Exotic Species Control Fund to evaluate alternatives for treating and managing ballast water. Total funding provided by the USFWS, SWRCB and the Port of Oakland for the West Coast Demonstration Project combined to a total of $450,000.

Ballast Water Exchange Verification - In October 2003, the Commission, acting as Trustee for the Kapiloff Land Bank Fund ("the Fund"), accepted funds in the amount of $200,000 from Carnival Cruise Lines, a division of Carnival Corporation, and deposited in the Fund as settlement for certain questions regarding compliance with ballast water management requirements under Public Resources Code Sections 71200 *et seq*. These funds were designated for projects relating to ballast water management under Public Resources code Section 71200 through 71271 and successor statutes.

Utilizing the aforementioned Kapiloff Land Bank Funds, CSLC has entered into an agreement with the Smithsonian Environmental Research Center (SERC) to test explicitly the application of Ballast Water Exchange verification (BWEv) methodology on vessel traffic arriving to ports along western North America. In previous experiments, the BWEv methodology showed strong potential for discriminating between near coastal or port water. A refined methodology could therefore be used to develop a rigorous test for discerning exchanged ballast water from unexchanged ballast water on a vessel. The proposed research is intended to "demonstrate" the application of the BWEv methodology to a specific region, as well as expand the overall scope of our ongoing analyses and possible application on a global basis. This work builds upon significant national and international efforts to implement a reliable, affordable, and easy-to-use method for BWEv. The CSLC-SERC project will begin June 2005 and June 2007. Sampling events will be scheduled to occur on a quarterly basis, beginning in June 2005.

Hull Fouling - With funding from the MISP, the Aquatic Bioinvasion Research and Policy Institute (ABRPI), which combine the SERC's marine expertise and Portland State University's freshwater expertise, will conduct a study to examine the potential for invasions to California through the fouling vector. Using data on vessel dimensions and arrivals, SERC will estimate the total vessel surface area on a variety of vessel types that 1) Arrive to port systems in California, Oregon, and Washington, and 2) Have the potential to be colonized by fouling organisms. The study will also include a pilot project that will utilize Remotely Operated Vehicle (ROV) collected videos, still images, and diver collected samples to

estimate the amount and types of organisms attached to exposed surfaces. These complimentary analyses will move towards creating a broad understanding of the overall risk fouling poses for NIS introductions to California. The CSLC-ABRPI project will begin June 2005 and conclude July 2007.

SUMMARY OF OTHER RESEARCH

In addition to research fully or partially funded by CSLC, two studies highly relevant to the prevention and management of NIS in California have been funded or directed by CSLC collaborators. Both were extensive, multi-agency, multi-institution enterprises, for which the MISP provided some assistance with logistics or document review. The first was three part study on local container vessels, funded by the Port of Oakland, evaluating the effectiveness of ballast exchange for removing planktonic organisms, and examining the biota that arrive to the port in ballast tanks and in fouling communities. The second, directed by the California Department of Fish and Game, sought to characterize the distribution of estuarine and coastal invasives in California.

CDFG Invasive Species Survey - Under the 1999 legislation, the California Department of Fish and Game (CDFG) was the primary agency required to conduct a study to determine the location and geographic range of non-indigenous species in California estuaries and coastal areas. The study focused on areas where introduced species from ballast were most likely to occur. Biological sampling took place for infaunal and epifaunal areas, as well as for fish and plankton. Biological data collected during this study will provide the basis for a more comprehensive analysis of impacts from non-indigenous species and will serve as a baseline to determine effectiveness of future management efforts to control species introductions.

MOVING FORWARD

Improving Compliance - Although California's Program continues to be very successful, resulting in high compliance with all requirements of the Act; data indicate a persistent yet small percent of vessels violating the ballast water management mandates. Specifically, those vessels arriving from Mexican, Central and South American ports account for 85% of the volume of ballast water discharged that does not comply with the Law. Further analysis shows that many of these vessels are conducting some form of an exchange, but not to the prescribed legal standards set in the Act (i.e., exchange at >200 nm from land). Because of this analysis, CSLC has refocused the intensive compliance monitoring of reporting forms, the education and outreach to vessels owner operators and as necessary pursue enforcement actions on offending vessels. Additionally, CSLC continues to aggressively explore and support research addressing shipboard treatment technologies and alternative exchange zones within coastal waters.

Regulations Governing Coastal Voyages - Current California law requires that vessels originating from places outside of the EEZ manage ballast water, however, there is no ballast management requirement for vessels that arrive to California ports from places within the EEZ. The transfer of NIS from an invaded port to an adjacent port poses a significant risk for introducing and spreading species throughout a region (Lavoie et al. 1999, Cohen and Carlton 1995). On the west coast in particular, a highly invaded area, such as the San Francisco Bay, can serve as a hub for NIS to spread to other Pacific Coast Region ports, such as Los Angeles or Portland. In recognition of this vulnerability, the Marine Invasive Species Act of 2004 directs the CSLC to adopt ballast management regulations for transits between ports within the Pacific Coast Region, defined as the region 200 nm offshore, from 154 degrees W longitude and north of 25 degrees N latitude, exclusive of the Gulf of California.

Based on recommendations from the two Coastal Exchange workshops, the CSLC Technical Advisory Group came to the consensus for ballast water exchange at least 50 nm offshore for voyages within the Pacific Coast Region. The 50 nm limit incorporated several key issues of concern. Although ballast water exchange at distances more than 200 nm offshore is considered the most biologically prudent, vessels traveling within the Pacific Coast Region could be diverted more than 100 nm offshore from their normal route. For most voyages, the 50 nm distance would require no course deviation for some vessels and a minor deviation for many. Exchange at 50 nm avoids ballast discharge in coastal "retention zones" and at the mouths of estuaries, where currents and tides can carry organisms to shore or sweep them into bays and estuaries. The limit also lies beyond the boundaries of sensitive protected areas, such as National Marine Sanctuaries. Further, the maritime industry requested that California's regulation be

consistent with other U.S. state, federal and international regulations, in order to avoid confusion that would occur should vessels encounter a patchwork of varying regulations as they traveled across jurisdictions. The 50 nautical mile limit addressed this request, as Washington and the International Maritime Organization have similar requirements and Oregon has adopted legislation that mandates the same.

An exemption was included for voyages between ports within the San Francisco Bay/Delta region, and for voyages within the Los Angles/Long Beach/El Segundo Port Complex. In the absence of such a designation, the 50 nm requirement would pose an operational and economic burden for vessels transiting between ports contained within a single port region. Scientific experts consulted agreed that, biologically, the designation was reasonable given the current knowledge of NIS dispersal within an estuary, and given the logistical realities of vessel voyage patterns (Cohen pers com., Crooks pers com, Kimmerer pers com, Weisberg pers com.)

Rulemaking documents for the regulation were submitted to the Office of Administrative Law in April 2005 and the Notice of Proposed Rulemaking was published April 15, 2005. Following public hearings and consideration of public comments, the final regulation is anticipated to be approved in June 2005 with an implementation date in late 2005.

The Commission staff held two public hearings. The first on June 2, 2005 in Southern California and the second on June 8, 2005 in Northern California. For the vast majority of commercial vessels that fall under this regulation, near-coastal ballast exchange will be the primary method of ballast water management. Currently, it is the best compromise of efficacy, environmental safety, and economically practicality. According to industry representatives, the vast majority of vessels are capable of conducting exchange, and the management practice does not require any special structural modification to most of the vessels in operation.

The shipping industry has expressed concern that a small minority of vessels and/or commercial shipping routes may be significantly impacted by the proposed regulations. Commission staff recognizes this possibility. These vessels and/or commercial shipping routes can be categorized in two ways. The first are vessels that, due to special safety circumstances, are unable to perform ballast water management as described in the proposed regulation. For example, ballast water exchange as outlined in the regulations may pose a serious personnel safety concern for tugs and barges. Safely moving a crew from a small boat to a barge could pose a serious safety risk. To address this issue, a provision is included in the regulation, ensuring that the safety of the vessel, its crew, or its passengers is not compromised by the management requirements specified in the regulation.

The second general concern relates to a minority of vessels, for which compliance with the proposed ballast water management requirements may present some hardship not related to safety. To address this issue, a petition process has been included in the Rulemaking package that would allow impacted entities to present individual hardship cases and associated alternative ballast management proposals to the Commission. This section is necessary to provide flexibility for the Commission to consider special hardship cases from the maritime industry, and associated alternative management proposals, on a case-by-case basis, while providing a formal public notification and/or review process.

A broader concern, related to the “shared water” designation, was expressed by the industry. It has been suggested that the proposed regulations should include geographically extensive shared water designations similar to those used in Oregon and Washington. For example, for transits between Los Angeles and San Diego, and for voyages between the San Francisco Bay-Delta to Eureka, the industry has requested various relaxations to the requirement for exchanging ballast at locations 50nm offshore and 200 m depth.

In consideration of these concerns, staff subsequently contacted several scientific experts, reviewed relevant scientific literature, and completed preliminary analyses to address the issue. In summary, the best available information strongly indicates that estuarine (bay/port) ballast water should not be

transported between California ports, and this includes voyages between the specifically mentioned short-haul voyages.

- Natural transport of organisms between estuaries appears to be very low, in the absence of human activity.
- Short coastal voyages are more likely to transport organisms in good physical condition, maximizing chance for establishment in a new area.
- The San Francisco Bay estuary is one of the most highly invaded areas of the world, and is likely to act as a "hub" from which non-indigenous species can spread to other areas of California.
- Many non-indigenous organisms found in one of the aforementioned ports are not yet found in the other. The potential for their continued spread should be minimized.
- Some non-indigenous species in San Francisco Bay are clearly problematic or are found in very high numbers, and have not yet been found in Humboldt Bay (Table 3). Examples include the Chinese mitten crab and the Asian clam.
- The region between San Diego and Point Conception is an oceanographic "retention zone" where water re-circulates for extended periods. These zones have the capacity to retain organisms released in them, and oceanographers have explicitly recommended avoiding ballast exchange in them.

Finally, several commenters suggested the inclusion of language stating that a vessel should not be required to deviate from its intended voyage or unduly delay its voyage to comply with ballast water management requirements. Without further contingencies and definition, a small deviation or minor delay in an intended voyage could easily be claimed, exempting those voyages and significantly weakening the ability of this regulation to effectively prevent or minimize the introduction and spread of NIS. Furthermore, the inclusion of this language puts the decision to comply in the hands of the regulated community, not the regulatory agency. Additionally, it is believed that without sufficient definition, this language would not meet the "Clarity Standard" required in the California Administrative Procedures Act. As an alternative, Staff has included a petition process that would allow impacted entities to present individual hardship cases and associated alternative ballast management proposals to the Commission.

Performance Standards Advisory Panel Description - The CSLC is required, in consultation with SWRCB and in consideration of the advisory panel (Panel), to submit to the Legislature a report that recommends specific performance standards for the discharge of ballast water into the waters of the state. The performance standards will be based on best available technology economically achievable and be designed to protect the beneficial uses of state waters.

In late 2004, the CSLC invited participation from the stakeholder community to develop recommendations for performance standards. The Panel was first convened early in 2005 with meeting dates scheduled through June 2005. The Panel includes participants from the SWRCB, the Regional Water Quality Control Board, the CDFG, and the U.S. Fish and Wildlife Service, as well as representation from University experts, research groups, shipping agencies, ports, and environmental organizations.

Issues identified thus far include appropriate regulatory monitoring methods and impacts to coastal voyages versus oceanic voyages. Documents for review include but are not limited to publications on biological criteria, engineering feasibility, physical/biological/chemical characteristics of fresh and saline water, efficacy of reducing viable organisms under vessel operating conditions, economic costs of installation and operation of equipment, appropriate parameters for measuring treatment efficacy, and/or appropriate experimental designs for efficacy tests.

The Panel has spent significant time evaluating the discharge standards adopted by the IMO Convention to assess it potential effectiveness at preventing or reducing NIS introductions from ships' ballast water and the discharge standard proposed in U.S. legislation (e.g. S 363 – The Ballast Water Management Act of 2005).

The IMO Convention calls for ships to meet a ballast water discharge standard according to a schedule of fixed dates. While the IMO Convention is an important step forward in the effort to combat NIS introduced by ships' ballast water, the standard adopted represented only a slight decrease in the concentration of zooplankton and no reduction of phytoplankton from the observed median value for unmanaged ballast water, allowing 1000 organisms of the same size in 100 cubic meters. An analysis by the International Council for Exploration of the Seas of known concentrations of organisms in ballast tanks observed the median concentration for zooplankton was 400/m3 and the observed mean concentration for phytoplankton was 13.3/ml. This same group recommended a three orders of magnitude reduction below the observed median concentration for zooplankton and an equivalent or higher level or reduction for phytoplankton. The IMO Convention standard represents only a 1-order magnitude reduction in concentration of zooplankton from the median observed values for unmanaged ballast and no reduction of phytoplankton from the observed median value for unmanaged ballast. Fortunately, the IMO Convention explicitly recognizes the right of a party to take more stringent measures to prevent NIS introductions. The Ballast Water Management Act of 2005 (S 363) contains many of the provisions of the IMO Convention, however the concentration-based standard is 100 times more stringent than that found in the IMO Convention.

Panel recommendations will be provided to CSLC staff on or before July 1, 2005. CSLC is required to submit to the Legislature, a final report including recommendations for performance standards by January 31, 2006.

Non-Ballast, Ship-Mediated Invasion Vectors - The Act directs the CSLC, in consultation with a technical advisory group, to analyze the risk of invasion though fouling on commercial vessels, and present management recommendations to prevent such introductions. The legislation further specifies that the advisory group will include (but may not be limited to) representatives from the shipping and port communities, the USCG, state resource agencies, federal resource agencies, and the scientific research community.

A jointly administered workshop with California Sea Grant Extension on vessel hull fouling was held in May 2005. The workshop examined management perspectives and experiences from other states and countries (Hawaii, New Zealand), the risks and impacts from hull-born invasives to the west coast, and options for prevention and management. Attendees represented the commercial shipping and recreational boating communities, ports, vessel cleaning technology groups, state and federal resource agencies, environmental organizations, and scientific experts. CSLC staff is currently summarizing the results from that workshop.

The CSLC will hold two additional advisory meetings with a subset of the workshop attendees. These meetings are planned for September and December 2005, and will serve to solidify findings and recommendations with regard to commercial vessels. The final report will be completed for the state Legislature and public by March 1, 2006. As mentioned previously, CSLC will be funding the Aquatic Bioinvasion Research and Policy Institute (ABRPI) to conduct a study examining the potential for invasions to California through the fouling vector. The CSLC-ABRPI project will begin 15 June 2005 and concludes 31 July 2007.

NEEDED RESEARCH

Ballast Water Treatment Technology Development - Efforts to identify effective treatment technologies continue to progress slowly. The effort to develop effective technologies should be one of integrated phases, including R&D on basic and innovative technologies, prototype development, shipboard applications, and certification and implementation. CSLC continues its relationship with the USCG, National Oceanic and Atmospheric Administration (NOAA), and SERC to ensure continuity at the state, national and international level.

Standardized Analysis of Shipboard Treatment Technologies - Evaluating the performance of ballast water treatment technologies onboard ships, under realistic operational conditions, is a requirement of most ballast water management programs. The evaluation of treatment systems is difficult and costly.

Various approaches have been proposed making comparisons across technologies and even within the same technology difficult. The lack of standardization creates significant confusion about the criteria needed for evaluation and approaches to be used to determine compliance, allowing official approval for particular treatment systems. The USCG, Aquatic Bioinvasion Research and Policy Institute, and Pacific States Marine Fisheries Commission and CSLC are involved in the formative stages of this issue. CSLC continues its relationship with these entities to ensure continuity at the state, national, and international level.

CONCLUSIONS

Due to continued and expanded intensive outreach by CSLC staff, the utilization of Technical Advisory Groups and a monthly electronic notification system, along with daily interactions with maritime industry, and the potential for civil and criminal penalty action, compliance with the California Act has continued to improve (>95%). The Program's success and the relatively weak federal program, supports the continuation of the California Marine Invasive Species program.

CSLC has worked to coordinate with other states and the Federal government on ballast water and hull fouling management issues. Wherever possible California works with the scientific community, other West Coast states, the Federal government and the international community to standardize ballast water and hull fouling management programs. This coordination has resulted in improved support and compliance by the maritime industry and has enhanced the understanding and development of solutions to NIS introductions.

As discussed above, there is a significant amount of momentum in the Pacific Coast Region to prevent the introduction NIS. The existing framework in California has taken many years of stakeholder collaboration. The continued and increasing level of compliance within California's Marine Invasive Species Program reinforces stakeholder approval.

As Federal regulations are developed, the Legislature should strongly consider the continued success of California's Marine Invasive Species Program. California not only exemplifies the potential of state programs, but will compliment and reinforce Federal regulations for ballast water management. Preemption provisions may be beneficial in specific areas such as performance standards for the treatment of ballast water; however, broad preemption language for state programs would be detrimental to the over-all goal of controlling NIS introductions via commercial shipping in the United States.

The control of NIS via commercial shipping is a highly complex process requiring not only outreach and education in the maritime community, but most of all, regulatory consistency. Among other state programs, California has worked hard to establish a framework for the proper management of ballast water. The existing regulatory framework in California can be modified in conjunction with Federal regulations, which could provide an excellent foundation for the implementation of Federal rules.

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